

THE dialectical methods of the Middle Ages, admirably adapted to the sharpening of wits and the entertainment of audiences, have long been regarded by men of science as an inferior means of arriving at truth. I have no wish to enter into controversy with my friend Prof. Walsh as to the general merits of Aristotle. Yet I will venture to sum up in a sentence what I believe to be the conclusions of the overwhelming majority of modern Aristotelian scholars and of scientific men who have investigated the works of the master: *Aristotle's physical science is almost worthless from the modern point of view; it has scarcely any serious basis of observation and none of experiment; his biological works, on the other hand, show him to have been an admirable and careful observer of animal life.* He was thus an excellent naturalist but a very poor physicist. I will further endeavour to epitomise the verdict of most scientific students of the Middle Ages on his position in medieval science. *It was chiefly Aristotle's physical works that earned for him his scientific reputation in the Middle Ages; his biological works exerted little influence until the sixteenth century.* Those who assent to these propositions will not agree that "we have come to appreciate better medieval regard for him."

As regards Hugh of Lucca, I am aware of the existence of the "Chirurgia" of Theodoric, and that he was perhaps the son of Hugh, though, to my mind, Prof. Walsh has greatly exaggerated the scientific value of his work. But Theodoric's treatise, though certainly very interesting to us, was not greatly prized by the Middle Ages. Hence copies of it are very rare, and among the fifteen thousand or so medical MSS. that have survived in this country only one (Ashmole 1427, fourteenth century) contains it. A treatise possibly founded on it has survived in one English codex of somewhat later date (Magd. Coll. Cambridge, Pepys, 1661). Theodoric's treatise was not printed until 1498. I see nothing in it, or in what Prof. Walsh now says of it, to justify a modification of my criticism. The English reader who cares to learn more of Theodoric will find a sympathetic account of him in Sir Clifford Allbutt's "Historical Relations of Medicine and Surgery," and a very full analysis of his "Chirurgia" in E. Gurlt's "Geschichte der Chirurgie."

The judgment of the Renaissance printers in their selection of medical works is a matter of opinion. The sixteenth century had run a quarter of its course ere they made Hippocrates accessible (earliest Latin edition, Rome, 1525; earliest Greek edition, Venice, 1526). By that time the ponderous "Kanun" of Avicenna had already passed through at least twenty-two editions (Editio princeps, Strassburg, 1472). Those who rate Hippocrates higher than Avicenna—or than Theodoric—will rate the judgment of the Renaissance printers—and readers—accordingly.

Against Prof. Walsh's suggestion that I am opposed to any good being said of the Middle Ages I am sufficiently protected by my published works. However these be estimated, they will yet, I hope, guard me against the accusation of having neglected that period. Under such protection as they may afford I would add my regret to that of many of Prof. Walsh's other admirers that he does not use his great learning and literary gifts to portray medieval life as it was instead of as that of a *Civitas Dei*, which it was not. Whatever the scientific aspirations of the age, the scientific achievement was very small. The explanations of this failure are various, but in denying the fact Prof. Walsh belongs to an exceedingly small band of scholars whose conclusions seem also, to some of us, to be shaped by certain preconceived

ideas. But we shall not, on that account, value the less any contribution to knowledge that he may make. Oxford, June 12.

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Commercial Parasitism in the Cotton Industry.

THE opinion of Sir George Watt in NATURE of February 23 that the report to the Board of Trade of the Empire Cotton Growing Committee is "ingeniously elaborated," but leaves a "confused impression," may justify a brief consideration of an allied phase of the subject. Why "the whole history of cotton improvement is most disheartening" may be explained if an essential feature has been omitted. The argument for research is ably presented in the pamphlet issued at Manchester by the Provisional Committee on Research and Education for the Cotton Industry, but with no reflection of the actual state of production.

Not only should planters have industrial information, as recognised in Sir George Watt's proposal of a central research institution at Manchester, but on the part of manufacturers, financiers, economists, and commercial leaders there is acute need of agricultural information. Industrial interest in cotton improvement must be made effective through the commercial channels that lead back to the farmer. Problems of agricultural application must be solved, in addition to developing superior varieties, devising better cultural methods, and controlling diseases or insect parasites. The elaboration of the cotton research programme may be entirely logical, but without an effective tie-back to the farmer there can be no prospect of a general application of the results of technical investigation, either industrial or biological, to purposes of production.

The central cotton institution at Manchester should be equipped for any elaboration of research that may be necessary to determine and demonstrate to manufacturers the relation of the system of buying to the improvement of production. The parasitic tendencies of the present commercial system are not limited to the speculative features that are being restricted by law or to the taking of undue profits, but lead to enormous agricultural and industrial waste through the production and manufacture of inferior fibre, passed on to the consumer in weaker and more perishable fabrics.

To expect manufacturers to be interested in the cotton plant or in the details of farm operations in the growing of cotton might be unreasonable, but at least the financial aspects of cotton production would receive attention if manufacturers knew how their interests are prejudiced by the present commercial system. Instead of serving as a conductor of interest in improved production from the spinner to the farmer, the commercial system has the manufacturers and the growers fenced apart and misinformed regarding the general needs of the industry.

Manufacturers are accustomed to pay more for good cotton, and naturally suppose that the farmers who raise better fibre receive higher prices for their crops, but investigation will show that most of the profit is absorbed by the buyers. The commercial idea of improving cotton is by "classing" the present miscellaneous crop into the so-called "even-running lots." Buyers like to get long-staple bales at short-staple prices, but do not forgo present profits in order to encourage the improvement of future crops that somebody else may buy. The commercial system provides no incentive for improved production.

The farmer is at liberty, of course, to raise better cotton if he chooses, but extra care and expense must be given, with no assurance of being able to sell at a higher price. Instead of gaining an advantage or of being encouraged to continue the planting of a better

variety, the progressive farmer at the end of the season may find himself making a forced contribution to an unjust system. Naturally, he loses interest in raising cotton of better quality, and goes back to ordinary "gin-run" seed or to the shortest and most inferior variety that promises a large yield.

There is no agricultural reason why any part of the American cotton belt should produce less than inch staple, nor is it an advantage to any interest that the production of inferior, short, and irregular staple should continue, but the inertia of the system must be overcome. If longer and more uniform staples are to be grown, they must sell at least as readily and as profitably as short staples. Since the farmer makes no use of cotton at home, but raises it only to sell, the quality of the fibre is of interest to him only as the price is affected. Better prices for better cotton are the only inducements that the farmer should be expected to consider. Preaching from any other text is sure to fall on deaf ears.

The present scarcity of superior fibre could be met most promptly and effectively by having more good cotton grown instead of wasting the resources of production by planting inferior cotton. The real obstacle is a defective commercial system, which undoubtedly could be changed without any great difficulty if the manufacturers had sufficient understanding of the conditions and needs. The problem, no doubt, is much the same in other countries as in the United States: to render production more efficient by improving the quality of the crop.

After two decades of investigation of cotton-breeding problems in the United States it is being recognised that the production of the best and most uniform fibre can be maintained only in communities that limit their production to a single variety of cotton, so that there shall be no mixing of different kinds of seed at the public gins or crossing of different kinds in the field. One-variety communities have been maintained for several years in the Salt River Valley of Arizona, where the practical advantages of the plan have been demonstrated and the commercial obstacles more clearly revealed.

Community production of better cotton in other regions might go forward rapidly if farmers were assured of better markets for good cotton than for short, mixed fibre. High prices may be expected to affect the quantity of cotton to be grown, but the quality will not be improved unless there is a distinct advantage in raising better cotton. So long as manufacturers are willing to take the present commercial system entirely for granted, and overlook its effect upon production, no prompt or general improvement is to be expected.

Lack of discrimination in buying from the growers is the weak point of the present system, not to be made good by paying all growers more for their cotton, but by paying more for good cotton and less for poor cotton. Discrimination in prices must be applied in the primary markets instead of the present careless and incompetent buying of "hog-round" lots at "flat" prices, which leads the farmer to produce the worst fibre instead of the best, because varieties with inferior lint often yield well or turn out high percentages of lint at the gin, and do not need such careful handling as the longer staples.

Not only the condition or "grade" of the cotton, but also the quality or "staple" need to be recognised while the cotton is still in the hands of the farmer. Outside of cotton markets it is seldom understood that the grades used in buying cotton from farmers have no relation to the essential textile qualities of length, strength, and uniformity of fibre, but only to incidental differences that result mostly from careless

picking or from exposure to the weather. The system buys grades from the farmer, but sells staples to the manufacturer, getting discounts from the farmer and premiums from the manufacturer.

Discrimination could be applied honestly and to the best advantage on the farm before the cotton is picked. Uniformity of the fibre, which is an essential factor of quality and value for textile purposes, can be determined much more readily and definitely while the cotton is still in the field than after it is brought to the gin or passed into the bale. Field inspection of the plants shows readily and easily whether the stock represents a select, uniform variety or is mixed with plants that yield only short, inferior fibre, as most of the "off" plants do when a good variety is allowed to deteriorate through admixture or neglect of selection.

If the cotton is mixed and irregular in the field there is no chance that the farmer will have high-quality fibre to sell, although the average buyer could not determine the admixture from the bale samples. The careless farmer usually sells his cotton at the same price as his more careful neighbours, to say nothing of the dishonest farmer who deliberately grows a mixed field with 20 per cent., or even 50 per cent., of short cotton, but gets the long-staple price for his crop.

The quality of the fibre is affected also by cultural conditions of soil, season, and methods of handling the crop. Even on the same farm or in the same field inequalities of soil or treatment may result in cotton of very different textile qualities, which would be marketed in separate bales if adequate discrimination in buying made such precautions worth while to the grower. The careful discrimination of quality that should be applied in the field can be made good only in part by the elaborate mill-tests by which the manufacturers try to protect themselves against too much waste and breakage in working the cotton. Such losses, as well as costs of cleaning and combing processes, undoubtedly could be reduced to a great extent through more careful buying and the more careful growing and handling of the crop which discriminating treatment of farming communities would secure.¹

Field-inspection buying may be considered as a new application of botanical knowledge, but the underlying facts have been established, and there is no reason to doubt that the talent applied in commercial sampling from bales could be used more effectively for determination of the quality of fibre before the cotton is harvested. Such a reform would give the commercial system a positive, constructive relation to the industry instead of the present negative, parasitic relation. Farming communities would turn at once to the production of fibre of better quality, to the general advantage of the cotton industry and the consuming public. No doubt the relation of prices to production has been overlooked because it is so simple and obvious, but a new approach is open to manufacturers through the organisation of one-variety communities. A strong department of commercial relations in the new Cotton Research Institute at Manchester would be a practical recognition of the principle approved by Sir George Watt: "The cultivator's interests are paramount." O. F. Cook.

Bureau of Plant Industry, Washington,

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¹ See United States Department of Agriculture Bulletins, "The Relation of Cotton Buying to Cotton Growing," "Cotton Improvement on a Community Basis," "Cotton Selection on the Farm by the Characters of the Stalks, Leaves, and Bolls," "Extension of Cotton Production in California," "Production of American Egyptian Cotton," and "Maintaining the Supply of Cotton."